

## **REMARKS**

Applicants acknowledge the receipt of the Office Action dated 19 March 2004 in which the Examiner:

- 1) objected to the disclosure because of informalities;
- 2) rejected claims 4, 17, 19, 24, 34, 35, 38, 43 and 44 under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention;
- 3) rejected claims 24-28, 30-38 and 43 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over *Primeaux* (US Pat. No. 6,133,927).
- 4) objected to claims 18, 29, 39-42 and 45-40 for depending on rejected claims.

In this Response, Applicants are:

- 1) amending the disclosure to correct informalities; and
- 2) amending claims 17, 19, 24, 34, 35, 38, 43 and 44.

### **A. Amendments to the Disclosure**

Applicants concur with the Examiner's comments regarding the informalities in the disclosure. Accordingly, Applicants have amended the disclosure per the Examiner's recommendations. Specifically, a new section entitled *Brief Description of the Drawings* has been added after paragraph [0029].

Also, the disclosure has been amended to change the term “polyurethane” to --polyurethane-- or --polyurethane/urea-- as necessary. These amendments are intended to correct language informalities and do not add new matter.

**B. Amendments to Claim 17**

The Examiner rejected claim 17 under 35 U.S.C. 112, second paragraph as lacking antecedent basis for “the carrier solvent reactor.” Claim 17 is amended to recite that the composition of claim 1 further comprises a poly(oxyalkylene)polyol in an amount sufficient to support the function of a carrier solvent reactant, rather than *the* carrier solvent reactant. This amendment is intended to correct the antecedent basis informality and does not add new matter. Claim 17 is therefore allowable. Applicant respectfully requests reconsideration and allowance of claim 17.

**C. Amendments to Claim 19**

The Examiner rejected claim 19 under 35 U.S.C. 112, second paragraph as having an informality in the recited the chemical formulation. Accordingly, Applicant the claim is amended per the Examiner’s recommendations. Specifically, the chemical formula for one embodiment of a propylene oxide adduct of trimethylol propane is amended to read  $(C_3H_6O)_{12}C_6H_{14}O_3$ . This amendment is intended to correct the chemical formulation informality and does not add new matter. Claim 19 is therefore allowable. Applicant respectfully requests reconsideration and allowance of claim 19.

D. Amendments to Claims 24, 34, 35, 38, 43 and 44

The Examiner rejected claims 24, 34, 35, 38, 43 and 44 under 35 U.S.C. 112, second paragraph as the term “polyurethane” is misunderstood. In concordance with the language informalities in the disclosure, claims 24, 34, 35, 38, 43 and 44 are amended to change the term “polyurethane” to --polyurethane-- or --polyurethane/urea-- as necessary. These amendments are intended to correct the language informalities and do not add new matter. Claims 24, 34, 35, 38, 43 and 44 are therefore allowable. Applicant respectfully requests reconsideration and allowance of claims 24, 34, 35, 38, 43 and 44.

E. “Stoichiometrically Balanced” in Claims 4, 24 and 44.

The Examiner rejected claims 4, 24 and 44 under 35 U.S.C. 112, second paragraph, as the Examiner did not understand the Applicant’s use of the term “stoichiometrically balanced.”

The term “stoichiometrically balanced” is used to describe the relationship between the primary diamine and the secondary diamine. The primary diamine and secondary diamine are blended together to form an oligomeric prepolymer component of the inventive solution. The concentrations of blended primary and secondary diamine are stoichiometrically balanced with each other. This achieves a stoichiometrically balanced diamine prepolymer component. This stoichiometrically balanced diamine prepolymer component may then be combined with modified diphenylmethane diisocyanates and a carrier

solvent/reactant to form one embodiment of the polyurethane/urea linked copolymer solution in accordance with the invention.

The term “stoichiometrically balanced” is properly used to describe the relationship between the primary and secondary diamine as they combine to form the prepolymer component of the inventive solution. Claims 4, 24 and 44 are therefore allowable. Applicant respectfully requests reconsideration and allowance of claims 4, 24 and 44.

#### F. Amendments to Claim 24

The Examiner rejected claims 24-28, 30-38 and 43 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over *Primeaux* (US Pat. No. 6,133,927). Claim 24 is the only independent claim rejected, as claims 30-38 and 43 each depend from Claim 24.

Primeaux discloses a two-part, sprayed-on elastomer coating with application lining the interior surfaces of railcars. col. 1, lines 17-33. In particular, the elastomer coating is optimized for metal surfaces. “Their fast reactivity additionally allows for uniform coating and film build over the sand blasted texture steel substrates. Polyurea systems further remain flexible over weld seams with no cracking.” col. 3, lines 10-14. Applicant’s invention is a wood preservative. Wood does not have a steel substrate or weld seams.

Claim 24 is directed to “a wood product,” and recites the limitation “coating and impregnating a wood product with the solution.” Primeaux does not disclose coating any wood product or conventionally treated wood (much less coating and

impregnating one) with a solution. Anticipation under 102(b) requires that the prior art disclose each and every limitation of the claim. For at least the reason that Primeaux does not disclose coating wood or a conventionally treated wood product, claim 24 exhibits the requisite novelty over the art of record.

Either Applicant's wood preservative or Primeaux's coating may perhaps be applied to either wood or metal surfaces. However, even if so, significant differences in the applications would naturally have led to significant differences in the formulations and properties of the different coatings. An effective wood preservative, such as Applicant's invention, is characterized by its ability to penetrate the surface of the wood, to impregnate deep into the porous, fibrous body of the wood, providing a more effective barrier to moisture invasion and/or toxic chemical leaching than would a mere surface coating. Penetration into the substrate body requires low viscosity, and relatively long gel times – both are features of Applicant's inventive wood preservative. Precisely the opposite is true for a coating designed for metal surfaces, where no impregnation below the surface is possible. In that application, an effective coating should have fast gel times and high viscosity, to prevent runs and drips as the coating is applied to the metal. Primeaux discloses precisely these features of its two-part, spray-on coating.

That the coating of Primeaux is two-part is manifest throughout the reference. *E.g.*, "This two-component technology" col. 1, lines 20-21; "Spray polyurea elastomers made from an (A) component and a (B) component" col. 1, lines 12-13; A and B components discussed at col. 5, lines 33-39; "The (A)

component and the (B) component of the present spray polyurea elastomer system are combined or mixed under high pressure” col. 8, lines 56-57; “the volumetric ratio of the (A) component to the (B) component” col. 9, lines 1-2; “component (A) and component (B) are employed in a 1:1 volumetric ratio” col. 9, lines 4-5; *See also*, all formulation examples I through V, col. 9, line 30 – col. 15, line 18.

Furthermore, the only method of applying the coating disclosed in Primeaux is spraying on, in which process the A and B components of the coating are mixed together:

The (A) component and the (B) component of the present spray polyurea elastomer system are combined or mixed under high pressure; most preferably, they are impingement mixed directly in the high pressure spray equipment itself. In particular, a first and second pressurized stream of components, such as components (A) and (B), respectively, are delivered from separate chambers of the proportioner and are impacted or impinged upon each other at high velocity to effectuate an intimate mixing of the components and, thus, the formulation of the elastomer system, which is then coated onto the desired substrate via the spray gun.

col. 8, lines 56-67. This mixing of the A and B components in the spray gun is necessary due to the extremely fast reactivity gel times of Part A and Part B once mixed together, which range from 2 sec. (formulation example I, col. 9, line 40) to

9.5 sec. (formulation example IV, col. 12, line 57). If Primeaux were applied as a protective coating for wood (an application on which Primeaux is silent), such very fast reactivity gel times would virtually preclude any realizable impregnation depth of the coating into the wood below the surface plane. Primeaux's formula is thus effectively restricted to a surface coating only, even if applied to wood.

In addition to very fast gel times, the complete lack of any possible significant impregnation depth of the Primeaux coating is evidenced by admission that the "A" component requires viscosity reduction by an organic alkylene carbonate. col. 2, lines 21-24. The viscosity reduction is disclosed as enabling improved mixing of Part A and Part B in the 2-head heated mixing gun (col. 9, lines 59-60 and 38-39). However, it is self-evident and readily recognized by those of skill in the art that lower viscosity fluids naturally have a higher impregnation rate and depth than do higher viscosity fluids. The fact that viscosity-lowering additives are necessary to even effect mixing of the Primeaux coating components is telling of the high viscosity of the coating itself, further evidencing that the coating is a surface coating only.

Indeed, Primeaux discusses only the adhesion of its coating to the applied surface. "Such coatings ... should have excellent adhesion to the interior surface" col. 1, lines 25-26; the coating "can be directly applied to a substrate such as the interior of a railcar." col. 2, lines 30-31; the spray coating "has excellent adhesion to the substrate over which it is applied." col. 2, lines 33-34; the coating "can be directly applied to a prepared substrate. col. 2, lines 56-57.

As known in the chemical arts, “adhesion” refers to attractive forces applied at a surface, in distinction to “cohesion” which describes attraction throughout a material, *i.e.*, at an impregnation depth below the substrate surface. “Adhesion: The molecular attraction exerted between bodies in contact. See Cohesion.” (www.dictionary.com). “Cohesion: That form of attraction by which the particles of a body are united throughout the mass, whether like or unlike; -- distinguished from adhesion, which unites bodies by their adjacent surfaces.” (www.dictionary.com). Primeaux does not disclose cohesion resulting from the penetration of its sprayed-on coating below the surface depth of the substrate to which it is applied and to which it adheres (following gelling, which occurs in less than 10 sec.); rather, Primeaux discloses only surface adhesion.

With this understanding of the disclosure of Primeaux, it is clear that the present invention as claimed defines both novelty and non-obviousness over Primeaux. A significant feature of the present invention – indeed, a significant advance of the state of the art in polymer wood preservatives – is its one-part formulation.

The resultant reaction solution is a 'single pot' polyurea composition that can be stored for a long period of time, e.g. 6-9 months at 25°C without exhibiting any instability or gelling out of the polyurea. Accordingly, this single pot composition can be applied in any manner for a synthetic polymer process, e.g., casting, molding, spraying, etc., where, after application, the single pot composition is treated, e.g. by heating, vacuum



evaporation, etc., to remove at least a portion of the stabilizing carrier, leading to the formation of a solid, cured polyurea material.

Specification, p. 17, lines 5-11. This is further discussed with respect to the solvent or carrier of the inventive wood preservative:

A suitable stabilizing carrier is one which will completely dissolve the selected aromatic diamine derivative and the selected polyisocyanate when they are combined to form a reaction solution but which will prevent the resultant polymeric reaction product, i.e. the polyurea, from solidifying or gelling out of the reaction solution. In other words, the stabilizing carrier either prevents the normally near instantaneous reaction between the isocyanate group and the amino group or prevents the resultant reaction product, e.g. polyurea, from solidifying or gelling until such time as a portion of the stabilizing carrier or solvent is removed from the resultant solution, e.g., as by evaporation.

Specification, p. 13, line 24 – p. 14, line 5.

Compare the shelf life of Applicant's blended formulation of six to nine months with the 2 to 9.5 seconds of Primeaux (once Parts A and B are blended). The suspected mechanism underlying the suppression of polymerization in

Applicant's formulation is also disclosed in the Specification, at p. 21, lines 2-4, *et seq.*:

It is hypothesized that the resultant single pot polyurea formulation having a very long shelf life without any solidification or gelling of the polyurea, e.g., 9 to 12 months at a temperature of 5 to 45°C, is due to an *in situ* ionic shielding action.

Thus, Applicant's formulation defines patentably over Primeaux at least in that it comprises a one-part solution with a long shelf life. This represents a significant advance in the state of the art. Applicant's wood preservative formulation may be mixed in bulk at a manufacturing facility, packaged into convenient quantities (*e.g.*, gallons or 10-gallons), and shipped, stored, and delivered to the point of application as easily as paint, stain, and the like are currently distributed. In use, the preservative may be applied in the field by spraying from a conventional paint sprayer, painting, or rolling. No particular skill or expertise is required. This is in sharp contrast to the two-part, highly reactive, short gel time (2-10 sec.) coating of Primeaux, which requires a special, two-head sprayer to both mix and spray the Part A and Part B components, and skilled technicians to operate the sprayer.

Applicant's gel times following application are controlled by the evaporation rate of a solvent carrier, as discussed in the Specification. In various formulations, the gel time may range from 30-40 seconds (p. 31, line 6); to 4-5 minutes (p. 32, line 19); to 15-20 minutes (p. 33, line 16). These long gel times,

as well as the low viscosity of Applicant's inventive wood preservative, allow it to impregnate the body of the wood well below the surface layer, thus inherently forming both a surface coating and a concomitant impregnation for superior protection and leach-out prevention.

This impregnation is naturally enhanced by the low viscosity of the preservative. As disclosed in the Specification, one formulation provides a "low viscosity liquid for enabling complete preservation impregnation of dense low porosity wood grains. *e.g.*, spruce, fir, maple, walnut and mahogany." p. 31, lines 7-10. Another provides a "moderate viscosity liquid for enabling complete impregnation preservation of porous grain woods, *e.g.*, Southern yellow pine, oak, poplar, birch." p. 32, lines 21-22. Still another formulation provides a "low viscosity, high penetration liquid polymer solution for application as a hydrophobic surface sealant on old CCA-treated wood for the prevention of toxic leaching when surface exposed to environmental water conditions, *e.g.*, rain, snow, or excessive humidity." p. 33, lines 18-21.

The combination of slow gel times and low viscosity results in significant subsurface penetration and impregnation of the wood by the inventive wood preservative, providing a more effective hydrophobic shield preventing both moisture invasion of the wood and the leaching out of toxic chemicals. Conversely, the very fast gel times and high viscosity of Primeaux's coating would preclude any significant impregnation if the coating were applied to wood, relegating the coating to a surface coating only.

Claim 24 is amended herein to recite a one-part solution having a shelf life of at least 6 months. The limitation of a one-part solution defines both novelty and non-obviousness over the two-part solution of Primeaux, which must be mixed in a two-head spray gun upon application. Furthermore, claim 24 is amended to recite that the solution – the mixed solution of primary and secondary diamines, diisocyanates and a carrier solvent/reactant – has a shelf life of at least six months. The mixed solution of Primeaux has a shelf life of less than ten seconds. Finally, claim 24 is amended to recite that the inventive solution both coats and impregnates the wood product. Due to the low viscosity and slow gel times of the present invention, at least some penetration of the solution below the surface of the wood (and in most cases, significant penetration) is inherent and, indeed, unavoidable. For at least these reasons, claim 24 and all claims depending therefrom exhibit patentable novelty and non-obviousness over the disclosure of Primeaux.

All dependent claims include each and every limitation of their respective parent claim, and as such, all claims depending from amended claim 24 exhibit patentable novelty and non-obviousness. However, Applicant independently, respectfully traverses the rejection of claims 30-33 and 35-36. Claim 30 recites that wood treated with the preservative of the present invention is non-supportive of combustion. Primeaux makes no mention whatsoever of flammability or combustibility of its two-part, spray-on surface coating (not surprisingly, since as a metal coating, flammability would not be a major concern). Deep subsurface impregnation of the preservative of the present invention – which the coating of

Primeaux cannot achieve due to its high viscosity and short gel times – severely limits the oxygen access required to initiate and maintain continued combustion. As Primeaux is completely silent on the issue, it cannot possibly anticipate or render obvious the non-combustibility limitation of claim 30.

Claim 31 recites that the wood preservative of the present invention is termicidal. This mechanism is discussed extensively in the Specification at p. 27, line 9 – p. 28, line 8. Again, it is the deep impregnation of the wood preservative due to its low viscosity and long gel times that provides the termicidal property by denying termites a significant diet of non-treated wood. Applicant is unaware of a large termite infestation of metal railcars, which likely accounts for Primeaux's complete and total silence on the matter. Even assuming the spray-on surface coating of Primeaux were applied to wood, and assuming it is not itself digestible by termites, the Examiner has articulated no reason why termites who once penetrate the coating (such as by exploiting a defect in its application), could not eat out the lumber from within, leaving an empty, 10mm-thick shell of Primeaux's coating. Primeaux cannot anticipate or render obvious that on which it is completely silent.

Claim 32 recites that wood treated with the present invention meets non-hazardous landfill requirements for waste disposal. Here again, Primeaux provides absolutely no disclosure, teaching or suggestion whatsoever as to the suitability for disposal in a non-hazardous landfill of wood that may hypothetically be treated with its coatings. The present invention meets these requirements as it is (a) non-toxic in the polymerized state, and (b) non-biodegradable in either

soil or water-dominated environments. As known to those of skill in the art, many polyurea spray coatings do not meet these prerequisite requirements for disposal in a non-hazardous landfill. As Primeaux is completely silent on the issue, it cannot anticipate or render obvious claim 32.

Claim 33 recites that wood treated with the present invention does not degrade from exposure to solar ultraviolet light. Primeaux is completely silent as to the ability of its spray-on polyurea surface coating to withstand UV exposure. Since the primary application of Primeaux is the interior of railcars, there is no reason that one of skill in the art would believe it was a concern of Primeaux, or that the Primeaux coating would be formulated to withstand UV degradation. In any event, Primeaux neither anticipates nor renders obvious the UV-resistant limitation of claim 33.

Claim 35 recites a distention-to-yield of 450% to 680%. Primeaux does not disclose or suggest any distention-to-yield value, as such is not generally of concern to a coating for metal surfaces. Based on the chemistry disclosed, and the fact that Primeaux is limited to a surface coating of approximately 10mm, one of skill in the art would recon a distention-to-yield value for Primeaux's coating in the 10% to 15% range. See Van Nostrand and Reinhold, Plastics Engineering Handbook of the Society of the Plastics Industry, 5<sup>th</sup> Ed. 1991. The claimed distention-to-yield value of 450% to 680% of the present invention has been verified by independent lab tests, as well as ASTM test standards. Nothing in Primeaux provides any legal basis for a novelty or obviousness rejection of claim 35.

Claim 36 recites the ability to coat and impregnate damp wood. Not only is Primeaux completely silent as to the ability of its two-part, highly reactive, short gel time (2-10 sec.) spray-on polyurea coating to adhere to wood at all, it is equally silent as to its ability to adhere to damp wood. It is well known to those of skill in the art that applying such a spray to a damp surface commonly results in micro-foaming when the spray hits a damp spot, loss of surface adhesion, loss of abrasion resistance, loss of impact resistance, and loss of surface adhesion within a few months. Particularly in the face of such conventional wisdom in the art to the contrary, the complete silence of Primeaux as to its coating's efficacy when applied to a damp surface – much less damp wood – cannot possibly anticipate or render obvious claim 36.

Claim 24 and all depending claims exhibit novelty and non-obviousness over the prior art of record. Thus, claims 24-28, 30-38 and 43 are therefore allowable. Applicant respectfully requests reconsideration and allowance of claims 24-28, 30-38 and 43.

G. Objection to Claims 18, 29, 39-42 and 45-50

The Examiner has objected to dependent claims 18, 29, 39-42 and 45-50 for depending upon rejected base claims. All dependent claims include each and every limitation of their respective base claim. Base claims 17, 24 and 44 have been amended and are allowable over the cited art. Therefore claims 18, 29, 39-42 and 45-50 are allowable. Applicant respectfully requests reconsideration and allowance of claim claims 18, 29, 39-42 and 45-50.

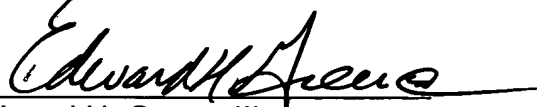
### CONCLUSION

For the above reasons, all pending claims as amended herein comply with all § 112 requirements, and are novel and non-obvious over the prior art.

Accordingly, Applicant respectfully requests prompt allowance of all claims.

Respectfully submitted,

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